U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE
NATIONAL METEOROLOGICAL CENTER

OFFICE NOTE 115

The NMC Front End to the NOAA 360/195 System

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MARCH 1975

THE NMC FRONT END TO THE NOAA 360/195 SYSTEM

This little note is a simplified description of the NMC computer system on the 3rd floor of FOB#4. With the advent of an operating channel to channel interface to the 360/195 system this becomes part of a totally integrated system for receiving, relaying and collecting data making analysis, forecasts, graphics and other processed information and feeding the results into the NWS domestic teletype and facsimile nets and into the GTS, FAA, Canadian, Bureau of Reclamation and military distribution systems.

Figure 1 shows the functional relations of the principle hardware. Three CPU's are on line at all times operating in automatic mode. The Process360/40 and the Fax 360/30 operate under DOS, the communication 360/40 operates under CCAP (an IBM originated locally modified communication system.) The current version is modified from the DUPONT version. The functioning of CCAP will be explained later. The Process 360/40 has one foreground partition operating the channel to channel interface with the 360/195. The control program associated with this function operates in the file interleaved mode.

A program wishing to output a file on the 195 disks to NMC passes the file name through an internal region to region service interrupt in the 360/195 to the interface handler in the 195. The interface handler will capture the file and pass it to its output que. This will allow the generating program to exit similar to the way printing files to a terminal are handled. Transmission of a file is initiated by a control block which signals the 360/40 program to call an overlay appropriate to the file to be moved. Then the file is moved record by record to the appropriate storage of the NMC system. Transmission at both ends is double buffered. Note that the CTC appears on selector channel 2 of the process computer while disks appear on selector channel 1 allowing well overlapped operation at least as fast as tape. Use of overlays allows the program format and posting to take place so that the file will be picked up by the correct program.

Similar operation will take place in the opposite direction although this has not been fully specified.

In addition the process computer operates the NWS KCRT system and provides a time controlled region for batch-processing of data referred to later as the 3rd batch area.

The process computer has shared access with the facsimile disk set and the so-called swinging disk. The first holds the facsimile que and schedule controls; the second holds the unprocessed observation data set partitioned by processor, the hourly raw-data base, the Upper Air, Aircraft, and surface, random access bases, the transmission files going back to CCAP, and the data base for the KCRT. KCRT programs can post files to go back to CCAP for relay according to the switching directory.

On the right side of figure I is shown the analogue and digital facsimile circuits interfaced to the front-end controllers. On the left side of the diagram is shown the front-end equipment for the data circuits. Figure II shows the main interconnection across the interface. This includes the control display and entry devices by which NMC and Communication Division manages the operation of the system. The circuits marked as synchronous point to point are at 2400 bps and are full duplex. The others are at assorted low speeds.

Figure III shows a schematic view of the CCAP programs. The box marked Supervisory Controls provides a sequencing system for operating the main sequence. It provides Disk I-O at three-levels of priority and with overlapped seek. It provides the I-O interrupt handler which causes a sequence of actions to take place depending on the activity of a line. This creates continuous sequential files of incoming traffic, and causes transmission according to transmit que lists. All actions are started and stopped through the main sequence line-control but then the system continues according to data demands. The system provides a system clock interrupt every .1 minute which updates the system clocks for time stamping purposes. It controls the starting of time controlled actions through entry to the console control routine. It controls check-pointing for recovery purposes. It provides some security checks by testing various areas for activity and error flags and if o.k. reassumes the automatic alarm. The automatic alarm will trigger if it does not hear from the computer in 20 seconds.

The operation of the main sequence depends on the idea that every program is working a reasonably short time between I-O requests. Only check-point and line control under the interrupt handler post disk I-O requests without waiting. An I-O request therefore locks a program out of the main sequence so that lower level programs get a chance. Each I-O request returns control to the top of the main sequence so the frequency of activity depends on order in the main sequence. Wait state is the lowest order of the main sequence. Failure to reach wait state is evidence of (1) overloading, (2) program loop, or (3) bad coding. One of the chief security tests is that wait state is reached at least once every six seconds.

Console control was originally a program to schedule overlay programs (not shown) from the typewriter console. This was modified to allow internal movement of call paramenters to the console buffer and forcing a console entry. The program can look up the entry determine if it is overlay, batch 1 or batch 2 and put the request in the appropriate que. Programs can now be started from the Console, from another program to form chains or form circular (daisy) chains by the last in sequence calling the first.

KCRT control allows entry inquiry and control actions to be exerted from the Communications tech control or from the NMC Senior Duty Meteorologist at WWB. A disk swapping technique is used to allow programs to carry out conversational sequences independent of the action going on at another station.

Background program control can determine if a background area is not busy and a program waiting in que could be loaded. It is also able to look at the batch 1 and determine if any waiting in que are at a higher priority, it will then force a wait to I-O completion roll-out the incumbent and load the new code and later restore the rolled out code.

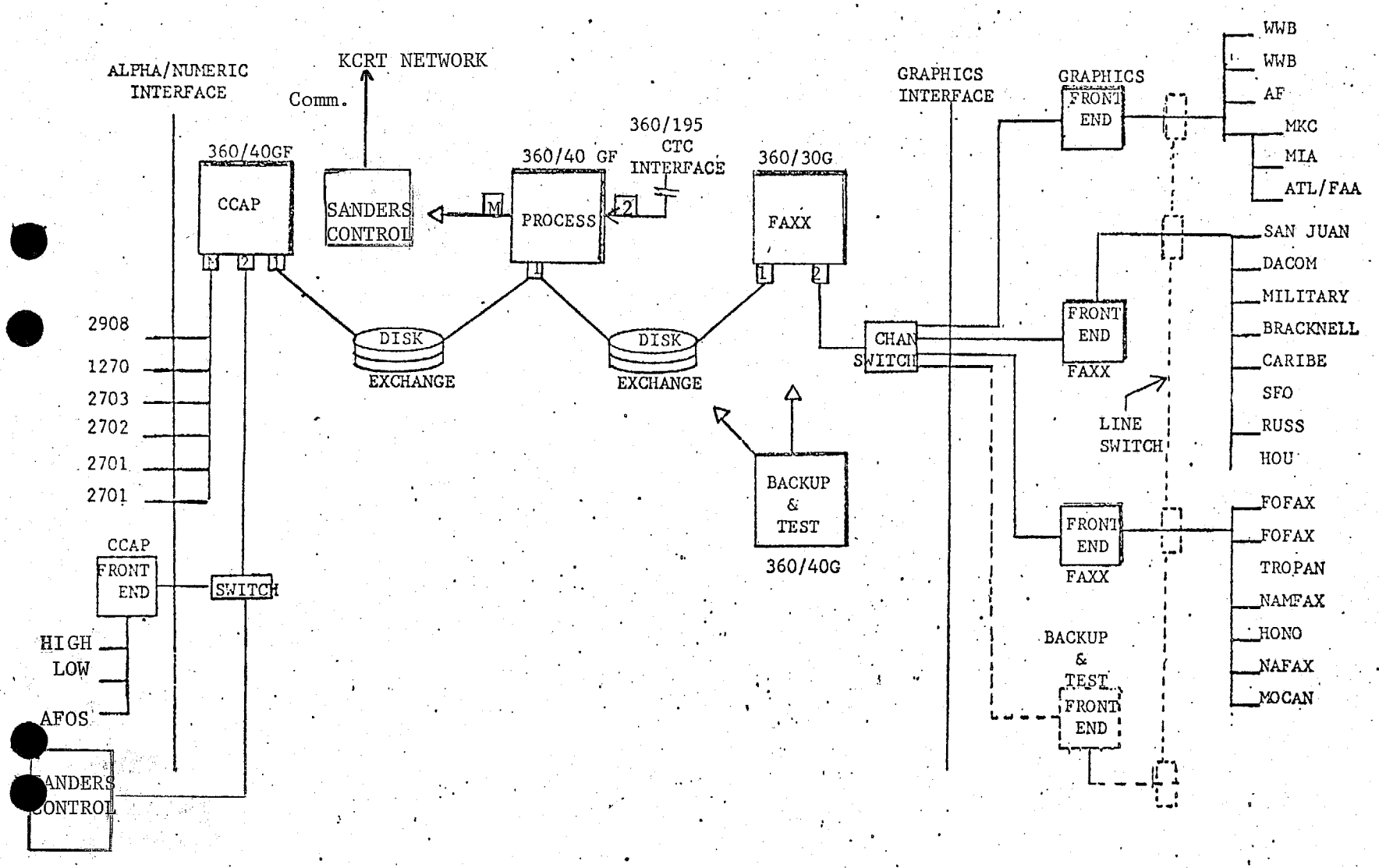
Batch 1 is used for the 2 minute cycle of programs called the daisy chain whose principle members are shown. Also because of the roll-in roll-out feature the principle large utilities run in this area. The second batch area codes have to do with decoding, reformatting and creation of new collections. Also as stated before a third batch area operates in the process computer, it is fed through the communication file called unprocessed data. Data may be returned through the transmission files.

Line control is a major functional area. The low speed procedures and the high speed procedures differ. The low speed procedure is a set of reentrant programs controlled through the line tables. Actions are started from the main sequence. Thereafter the interrupt handler sets a register to point to the place in the line table for the interrupting device. This defines all of the variable quantities necessary for the line control routines. High-speed procedure differs from line to line so there are several main sequence entries. High speed lines also divide their traffic into bulletins and identify these by unique catalogue numbers posted into the catalogue list. Transmission is done through a transmit Que which contains unique information for the line and a pointer to the text block.

The so-called daisy chain performs the traffic analysis function. Low speed lines are scanned and divided into message units. The header is checked for format and compressed into a normal form for directory hook-up. A message ending not followed by a start for five lines or more is blocked as an unknown message so also is one for which the header is not legtimate. These are posted into a KCRT program que which is examined at the Tech Controller station for manual correction. If the switch envelope is corrected the new message is returned to Header analysis for reprocessing. CAPQ processes the Header Analysis list, the catalogue lists input from the high speed lines, lists put in by the utility programs that load from tape, and from lists put up on the swinging disk pointing to data loaded from the 360/195 interface or from the KCRT's in the process computer. Entries that are not in the directory are returned to the unknown file. The switching directory lists every authorized message its expected source line and its destination. Destinations can include all communication lines, the local printer, and various decoding programs set up to break up and reprocess the text.

The remaining codes in the daisy chain process the CAPQ list. Qgen reformats traffic to required output form (Bandot, ASCII, etc.) and creates the transmit Que lists. Rgter puts the observational data on the undecoded data file separate for the various decoders. Rempe processes data for the line printers and for the KCRT.

There are other programs in the daisy chain but the ones described perform the principal functions. The second and third batch areas serve many data handling and bulletin preparation functions. Some are called up on various time intervals. Some are called up by other programs when data is present. A cryptic comment indicates what some of these functions are.



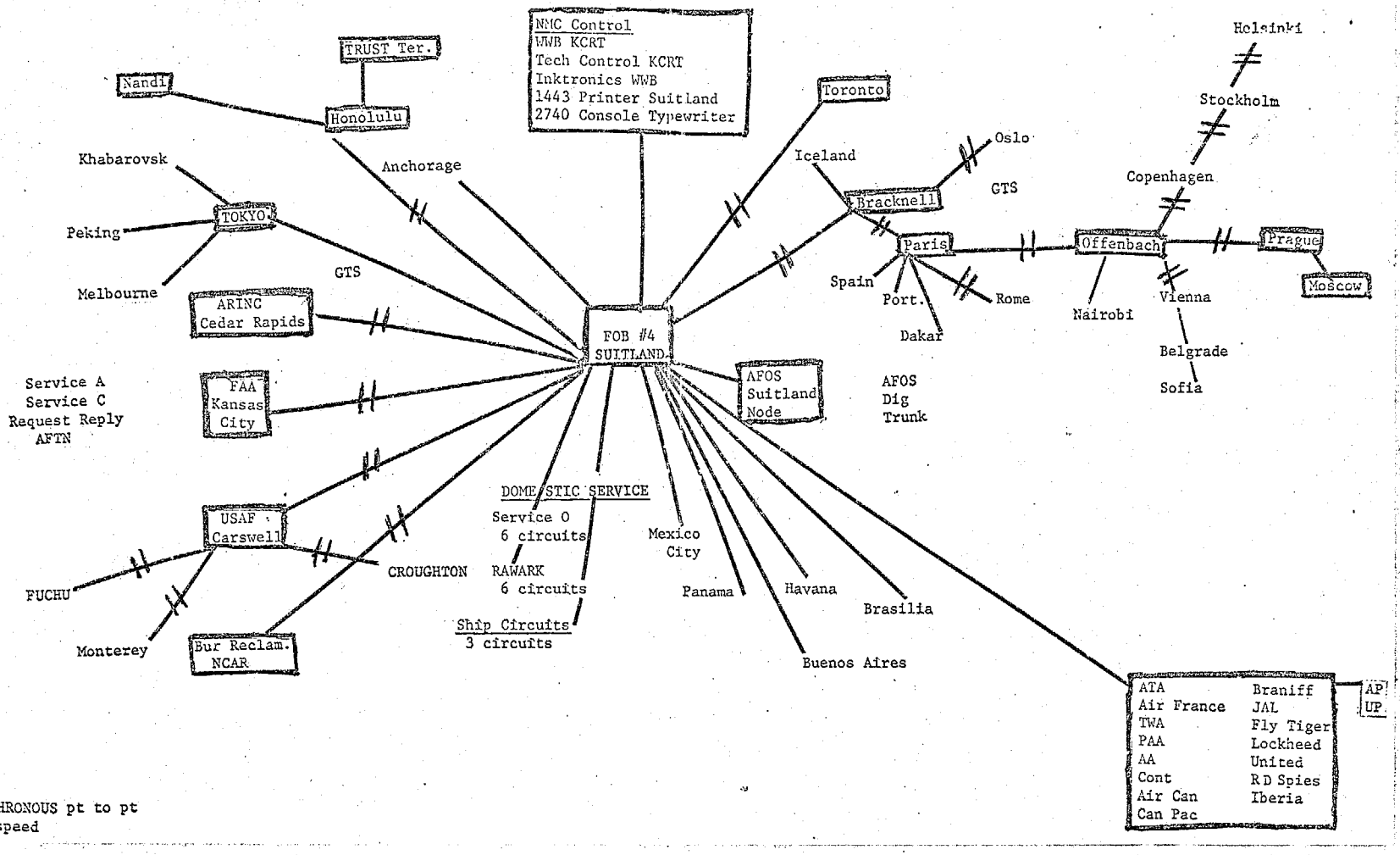
PROPOSED CONFIGURATION PLAN OF NATIONAL METEOROLOGICAL CENTER
Showing Functional Positions of the Front End Controllers

2.5.75

FI

Fig 1

NMC INTERCOMMUNICATIONS



= SYNCHRONOUS pt to pt
· Low speed

Fig 2

Schematic Communication Control Application Program (CCAP)

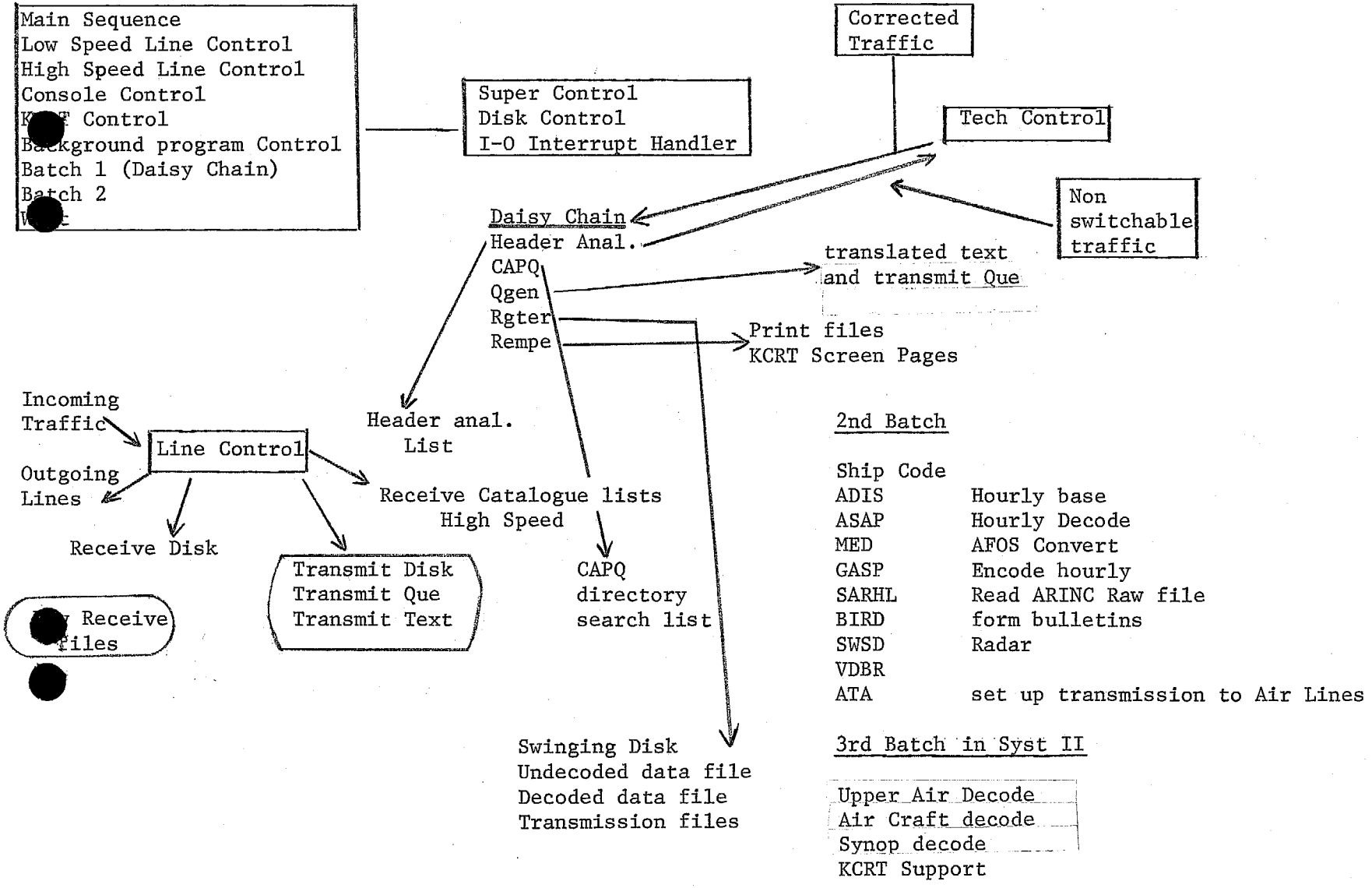


Fig 3